

WHAT IS CLAIMED IS:

1. A hybrid vehicle assembly comprising:
  - an electric motor/generator, which is operable as  
a motor and as an electrical energy  
generator;
  - an engine;
  - a connection between the electric motor/generator  
and the engine;
  - a first electrical storage mechanism connected to  
the electric motor/generator for selectively  
powering the electric motor/generator;
  - an energy conversion device continuously connected  
to the engine;
  - a second electrical storage mechanism; and
  - a voltage reducer coupled to the first electrical  
storage mechanism, the energy conversion  
device and the second electrical storage  
mechanism so as to provide charge from the  
first electrical storage mechanism, the  
energy conversion device and the electrical  
energy generator to the second electrical  
storage mechanism.
2. The hybrid vehicle assembly of claim 1 and  
further comprising:
  - a motor controller for rotating and controlling  
the rotational speed of the electric  
motor/generator;

a process controller to control the engine, the process controller controlling the engine to vary a rotational speed of the engine so as to be substantially synchronized with the speed of the electric motor/generator; and

a mechanical connection for connecting the engine to drive at least one ground engaging drive wheel when the engine speed is substantially synchronized with the electric motor speed.

3. The hybrid vehicle assembly of claim 2, wherein the process controller is connected to the motor controller to selectively switch the electric motor/generator to operate as the electrical energy generator for charging the first electrical storage mechanism when the engine is connected to drive the ground engaging drive wheel.

4. The hybrid vehicle assembly of claim 1, wherein the voltage reducer has a voltage input, which is connected to both the energy conversion device and the first electrical storage mechanism.

5. The hybrid vehicle assembly of claim 1, wherein the connection between the engine and the electric motor/generator is mechanically releasable.

6. The hybrid vehicle assembly of claim 1 and further comprising a drive shaft, which is coupled to the engine.

7. The hybrid vehicle assembly of claim 6, wherein the drive shaft is selectively coupled to the engine.

8. The hybrid vehicle assembly of claim 6, wherein the drive shaft is also coupled to the electric motor.

9. The hybrid vehicle assembly of claim 1 wherein the electric motor/generator and the energy conversion device are the sole sources for charging power for the first and second energy storage mechanisms on the hybrid vehicle assembly.

10. The hybrid vehicle assembly of claim 1 wherein the energy conversion device comprises an alternator.

11. The hybrid vehicle assembly of claim 1 wherein the energy conversion device converts between electrical and mechanical energy.

12. The hybrid vehicle assembly of claim 1 wherein the first and second electrical storage mechanisms each comprises a battery.

13. A hybrid vehicle comprising:

- an electric motor and an engine, both of which are drivably connectable to propel the vehicle;
- a first electrical storage mechanism on the vehicle for powering the electric motor;
- a single energy conversion device continuously coupled to the engine for providing a charging power output to the first electrical storage mechanism whenever the engine is running;
- a second electrical storage mechanism on the vehicle for providing power to vehicle accessories at a lower voltage than the first electrical storage mechanism; and
- a voltage reducer having an input coupled to both the single generator and the first electrical storage mechanism and having an output coupled to the second electrical storage mechanism to provide charging power at the lower voltage to the second electrical storage mechanism.

14. The hybrid vehicle of claim 13 wherein the electric motor is operable as a generator when the engine is propelling the vehicle to provide charging power to the first and second electrical storage mechanisms, the single generator and the electric motor being the sole sources for charging power on the vehicle.

15. The hybrid vehicle of claim 13 and further comprising:

- a motor controller for rotating and controlling the rotational speed of the electric motor;
- a process controller coupled to the engine for varying a rotational speed of the engine so as to be substantially synchronized with the speed of the electric motor; and
- a mechanical connection for connecting the engine to drive at least one ground engaging drive wheel when the engine speed is substantially synchronized with the electric motor speed.

16. The hybrid vehicle of claim 15, wherein the electric motor is switchable to a generator mode, wherein the process controller is connected to the motor controller to selectively switch the electric motor to the generator mode for charging the first electrical storage mechanism when the engine is connected to drive the ground engaging drive wheel.

17. The hybrid vehicle of claim 13 and further comprising a connection between the engine and the electric motor, which is mechanically releasable.

18. The hybrid vehicle of claim 17 and further comprising a drive shaft, which is selectively coupled to the engine.

19. The hybrid vehicle of claim 18, wherein the drive shaft is also coupled to the electric motor.

20. The hybrid vehicle of claim 13 and further comprising at least one ground engaging drive wheel, which is rotatable by the engine and the electric motor.

21. The hybrid vehicle of claim 13 wherein the single energy conversion device comprises an alternator.

22. The hybrid vehicle of claim 13 wherein the first electrical storage mechanism comprises a battery.

23. The hybrid vehicle of claim 13 wherein the second electrical storage mechanism comprises a battery.

24. A vehicle assembly comprising:  
an engine, which is drivably connectable to propel the vehicle assembly;  
a first electrical storage mechanism on the vehicle assembly and having a first voltage;  
a second electrical storage mechanism on the vehicle assembly for providing power to

vehicle accessories at a second voltage, which is lower than the first voltage; and  
an energy conversion device, which is continuously coupled to the engine and is coupled to the first electrical storage mechanism; and  
a voltage reducer having an input coupled to both the energy conversion device and the first electrical storage mechanism and having an output at the second voltage, which is coupled to the second electrical storage mechanism to provide charging power at the second voltage to the second electrical storage mechanism.

25. The vehicle assembly of claim 24 wherein the energy conversion device comprises an alternator.

26. The vehicle assembly of claim 24 wherein the energy conversion device converts between electrical and mechanical energy.

27. The vehicle assembly of claim 24 wherein the first electrical storage mechanism comprises a battery.

28. The vehicle assembly of claim 24 wherein the second electrical storage mechanism comprises a battery.